REMARKS

I. Claims Status

Claims 1 and 27 were previously cancelled. Claims 4-26 were previously withdrawn from consideration.

Claims 2-3 and 28 stand rejected. No new matter has been added.

Reconsideration of the application is respectfully requested in view of the remarks below.

II. Rejections under 35 U.S.C. § 103(a)

The Examiner rejected claims 2-3 under 35 U.S.C. § 103(a) as being unpatentable over Yamanaka, JP 06-128671, ("Yamanaka") alone, or alternatively over Yamanaka in view of Kritzer et al., An Assessment of Supercritical Water Oxidation (SCWO): Existing Problems, Possible Solutions and New Reactor Concepts, ("Kritzer").

The Examiner states that Yamanaka discloses a nickel-based alloy consisting of 38-45 weight percent Cr; 0.5-5.0 weight percent of one or more Mo, W, and V; up to 1.0 weight percent Mg; up to 1.0 weight percent Mn; up to 1.0 weight percent Si; and up to 0.07 weight percent C; 40-57 weight percent nickel; and the balance iron. The Examiner asserts that these amounts overlap the claimed amounts of the present application, and that it would have been obvious to one of ordinary skill in the art to select the desired amounts of the elements from the ranges of elements disclosed by Yamanaka because Yamanaka disclose the same utility throughout. The Examiner also notes that Yamanaka's embodiments have nitrogen amounts within the claimed range.

The Examiner further argues that Yamanaka's alloy would have excellent corrosion resistance relative to supercritical water environments containing inorganic acids because of a similar composition to the present invention. The Examiner, however, concedes that Yamanaka does not specify environments containing inorganic acids.

The Examiner asserts that Kritzer discloses nickel-based alloys that would have excellent corrosion resistance relative to titanium in supercritical environments in the presence of acid. The Examiner concludes that it would have been obvious to apply the nickel-based alloy used in alkali environments as disclosed by Yamanaka to inorganic acid environments, as disclosed by Kritzer, because nickel-based alloys would have excellent corrosion resistance in supercritical environments containing acids.

A. <u>Claim 2</u>

The present invention, as claimed in claim 2, is a Ni based alloy with excellent corrosion resistance relative to supercritical water environments containing inorganic acids, consisting of in weight basis:

(1) Cr: more than 43% and 50% or less;

(2) Mo: 0.1% to 2%;

(3) Mg: 0.001% to 0.05%;

(4) Mn: 0.05% to 0.5%;

at least one of (5) Fe: 0.05% to 1.0% and (6) Si: 0.01% to 0.1%;

(7) N: 0.001% to 0.04%; and

(8) a remainder as Ni and unavoidable impurities,

wherein a quantity of C amongst said unavoidable impurities is restricted to 0.05% or less, and the Ni based alloy consists essentially of a stabilized Ni-FCC matrix.

In contrast to the present invention, Yamanaka teaches an alloy with excellent stress corrosion cracking resistance, comprising:

(1) Cr: 38 to 45%

(2) at least one of Mo, W and V: 0.5 to 5.0% in total added according to need,

(3) Mg: 0.1% or less,

(4) Mn: 1.0% or less,

(5) Si: 1.0% or less,

(6) C: 0.07% or less, Ni: 40 to 57%, Al: 0.5% or less, and Ti: 0.5% or less, and

(7) Fe and unavoidable impurities as a remainder.

One aspect critical to the achievement of unexpected results by the present invention is the amount of Mo, in combination with the amounts of Cr, Si and Fe, that are included in the claimed composition. The present invention contains Mo within the range of 0.1 to 2%. This amount of Mo achieves the effect of improving corrosion resistance to supercritical water environments that contain phosphoric acid. (Page 9, lines 11-13). This effect manifests at Mo quantities of at least 0.1%, although at quantities exceeding 2%, the phase stability tends to deteriorate. (Page 9, lines 13-15 and Examples).

In contrast, Yamanaka teaches that Mo is not a critical component, but is merely an optional component. Yamanaka does not teach the necessity of Mo, and therefore, there is no rationale to arrive at the present invention based on the disclosure of Yamanaka.

The Applicant previously submitted a Declaration under 37 CFR §1.132 ("first Declaration") in order to disprove the prima facie case of obviousness asserted by the Examiner. The first Declaration demonstrated that the effect of the present invention cannot be achieved when the amount of Mo is within the range described in Yamanaka.

In this Office Action, the Examiner states the following about the first Declaration:

> "To establish unexpected results over a claimed range, applicants should compare a sufficient number of tests both inside and outside

> the claimed range to show the criticality of the claimed range. The data shown in Table 1 on page 4 of the Declaration does not compare a sufficient number of tests both inside and outside of the claimed range for Mo. Therefore, the criticality of the amount of Mo has not been established."

In response, Applicant provides arguments (below) and submits a second Declaration under 132 in order to further demonstrate to the Examiner the criticality of the amount of Mo of the present invention. The amount of Mo, in combination with the amounts of Cr, Si, and Fe, allows the present invention to achieve unexpected results, as demonstrated by the first and second Declarations.

First, Yamanaka uses Mo in examples 3 to 5, 12, 14 to 16, and 19 to 21 (see Table 1 shown below). Of these, each of examples 3, 12, 14 to 16, and 19 has an amount of Mo within the range of instant claim 2. Yet, in all of these examples (3, 12, 14 to 16, and 19) the amount of Cr, Si and Fe (the value computed from the amount of other components) are outside the ranges claimed by instant claim 2.

In the present Office Action, the Examiner also asserts the following:

> "The data shown in Table 1 on page 4 of the Declaration does not compare a sufficient number of tests with Fe and Si inside and outside the claimed range to show criticality of the claimed range. Furthermore, the closest value, in Table 1 on page 4 of the declaration, to 1 weight% Fe, as instantly claimed, would be 3.1 weight% Fe and the closest value to 0.05 weight% Fe would be no Fe (whereas, the composition disclosed by Kazuo Yamanaka et al. must contain Fe). Also, the closest value, in Table 1 on page 4 of the declaration, to 0.1 weight% Si, as instantly claimed, would be 0.32 weight% Si and the closest value to 0.01 weight% Si would be no Si.

> Thus, the criticality of the amount of Fe and/or Si as instantly claimed has not been established."

The unexpected results of the present invention require certain amounts of Cr, Fe, and Si. The attached second Declaration shows data in support of the criticality of these amounts.

To establish that the effect of the present invention cannot be achieved when any of or all of Cr, Fe, and Si amount are outside the range of instant claim 2, Applicant presents the data shown in the Declaration. Also, we will establish the criticality of the amount of Cr, Fe, and Si.

From Table 1 of Kazuo Yamanaka, with the examples containing Mo selectively extracted:

	C	Si	Mn	P	S	Ni	Cr	Ti	Al	Mg	Mo	W	V	N	Fe
Example 3	0.022 «	**0.41** »	0.46 «	0.01	0.001	50.63 «	**39.15** »	0.25	0.14	0.04 «	0.64 «	0	0	0.013 «	**8.234** »
Example 4	0.025 «	**0.38** »	**0.52** »	0.009	0.002	50.88 «	**39.63** »	0.26	0.15	0.04 «	**2.66** »	0	0	0.028 «	**5.416** »
Example 5	0.02 «	**0.36** »	**0.55** »	0.009	0.001	50.28 «	**39.46** »	0.23	0.13	0.05 «	**4.5** »	0	0	0.022 «	**4.388** »
Example 12	0.021 «	**0.39** »	**0.51** »	0.008	0.001	50.26 «	**40.01** »	0.3	0.14	**0.06** »	0.29 «	0.3	0	0.029 «	**7.681** »
Example 14	0.024 «	**0.32** »	0.5 «	0.007	0.001	50.02 «	**39.63** »	0.18	0.14	0.04 «	0.31 «	0	0.3	0.026 «	**8.502** »
Example 15	0.022 «	**0.36** »	0.48 «	0.007	0.001	50.36 «	**40.09** »	0.26	0.13	0.05 «	0.38 «	0.52	0.63	0.025 «	**6.685** »
Example 16	0.019 «	**0.41** »	0.44 «	0.01	0.01	50.26 «	**39.55** »	0.2	0.15	0.05 «	0.24 «	0	0	0.015 «	**8.646** »
Example 19	0.023 «	**0.44** »	0.5 «	0.009	0.001	49.92 «	**40.03** »	0.27	0.14	0.05 «	0.11 «	0.05	0	0.018 «	**8.439** »
Example 21	0.022 «	**0.48** »	0.49 «	0.013	0.001	50.63 «	**39.73** »	0.2	0.18	0.05 «	**0.08** »	0.09	0.1	0.029 «	**7.905** »

Legend:

» beyond the range of claim 2 (values bolded, also)
« within the range of claim 2

1. The amount of Chromium (Cr)

In the present invention, the minimum amount of Cr is 43 weight%. The present specification discloses that the quantity of Cr must exceed 43% in order to achieve the corrosion resistant effect (paragraph [0020]). In the second Declaration, please note that the upper limit of the amount of Cr is not set in order to achieve the effect of corrosion resistance, but to enable processing of the alloy (paragraph [0020]).

In contrast to the present invention, Yamanaka teaches that the amount of Cr is 38 to 45% (paragraph [0015]). In Examples of Yamanaka, there are a large number of examples in which the amount of Cr is between 38% and 43% (less than the lower limit of the present invention). All of these examples may achieve the effect that Yamanaka teaches.

However, as demonstrated by the results shown in the second Declaration, the effect of the present invention cannot be achieved when the amount of Cr is within the range of 38 to 43% (see Sample No. 2, and 5 to 7 shown in Table 1 of the Declaration).

These results demonstrate the differences between the present invention and Yamanaka in that the composition of Yamanaka achieves the effect of having stress corrosion cracking resistance, even in a high-temperature environment, for highly-concentrated alkali solutions, i.e. basic solutions. The present invention achieves the effect of having excellent corrosion resistance relative to supercritical water environments containing inorganic acid, i.e. acidic solutions, and also having excellent phase stability at 400 to 650°C.

Furthermore, the criticality of a minimum of 43 weight% of Cr is also established, as is clear from the results of the second Declaration (compare Sample No. 16 to 20 with No. 5 to 7).

2. The amount of Iron (Fe)

In the present invention, the amount of Fe ranges from 0.05 weight% to 1 weight%. It is disclosed in the present specification that Fe displays a strength improvement effect at quantities of at least 0.05%, whereas quantities exceeding 1% result in an undesirable deterioration in the corrosion resistance relative to supercritical water environments containing inorganic acid (paragraph [0026]). In the second Declaration, please note that the lower limit of the amount of Fe is not set in order to achieve the effect of corrosion resistance, but to achieve a strength improvement effect (paragraph [0026]), and thus it is not necessary to establish the criticality of the lower limit of the amount of Fe.

Yamanaka, however, does not specifically disclose the amount of Fe. For purposes of the second Declaration, the amount of Fe was computed from the amount of other components to be 4.388 to 8.646%.

Based on the results shown in the second Declaration, when the amount of Fe is greater than 1%, the corrosion resistance deteriorates and the effect of the present invention is not achievable (see Sample No. 3, 8, and 9). Therefore, the composition of Yamanaka, in which the amount of Fe is at least 4.388%, cannot achieve the effect of the present invention.

Furthermore, the criticality of 1 weight% of Fe is also established, as is clear from the results shown in the second Declaration (compare Sample No. 16 to 17, and 20 with No. 8 to 9).

3. The amount of Silicon (Si)

In the present invention, the amount of Si ranges from 0.01 weight% to 0.1 weight%. The present specification discloses that Si displays a strength improvement effect at quantities of at least 0.01%, whereas quantities exceeding 0.1% result in an undesirable deterioration in the corrosion resistance relative to supercritical water environments containing inorganic acid (paragraph [0027]). In the second Declaration, please note that the lower limit of the amount of Si is not set in order to

achieve the effect of corrosion resistance, but to achieve a strength improvement effect (paragraph [0027]), and thus it is not necessary to establish the criticality of the lower limit of the amount of Si.

Yamanaka teaches a range of Si from 0.32 to 0.48%. (See Examples) This range of the amount is beyond the range of Si (0.01 to 0.1%) in the present invention.

The results shown in the second Declaration demonstrate that when the amount of Si is more than 0.1%, the corrosion resistance deteriorates and the effect of the present invention is not achievable (see Sample No. 1, 10, and 11). Therefore, the teachings of Yamanaka, in which the amount of Si is at least 0.32%, cannot achieve the effect of the present invention.

Furthermore, the criticality of 0.1 weight% of Si is also established, as is clear from the results of the Declaration (compare Sample No. 17 to 19 with No. 10 to 11).

4. <u>Combination of amounts of Cr, Fe, and Si</u>

In addition to the criticality of the amounts of Cr, Fe, and Si individually, the second Declaration also demonstrates the importance of their combination in the correct amounts. When two or three of Cr, Fe, and Si fall outside the range of the present invention, and inside the range taught by Yamanaka, corrosion resistance relative to supercritical water environments containing inorganic acids deteriorates. The beneficial effects of the present invention are not achieved. (Compare Sample No. 16 to 20 with No. 4, and 12 to 15).

As demonstrated, the proper amounts of Cr, Fe, and Si are indispensible in order for the Ni-based alloy of the present invention to exhibit claimed high levels of corrosion resistance in supercritical water environments containing inorganic acids.

5. Conclusion

For the above reasons, the criticality of the amounts of Cr, Fe, and Si is established. In addition, the ranges of the amounts of Cr, Fe, and Si required by claim 2 are indispensable for displaying excellent corrosion resistance relative to supercritical water environments containing inorganic acids.

The difference of the criticality of Cr, Fe, and Si between the present invention and the invention of Yamanaka results from a difference in environments. The constitution of Yamanaka is intended to exhibit stress corrosion cracking resistance even in a high-temperature environments containing highly-concentrated alkali, i.e. basic solutions, whereas the constitution of the present invention is intended to exhibit excellent corrosion resistance relative to supercritical water environments containing inorganic acid, i.e. acidic solutions, and also having excellent phase stability at 400 to 650°C. As known to one of skill in the art, materials that resist corrosion in basic environments do not necessarily resist corrosion in acidic environments.

In view of the above, a person skilled in the art would not conceive the technical solution of the present invention based on the teachings of Yamanaka or by simply combining the composition of Yamanaka with the teachings of Kritzer.

Based on the above reasons, Applicants request that the obviousness rejections be withdrawn.

B. Claim 3

Claim 3 depends from independent claim 2. Claim 3 contains all the limitations of claim 2 and Examiner's rejection of claim 3 should be withdrawn as described above in regards to claim 2.

C. **Claim 28**

The invention as claimed by claim 28 is a system for detoxifying organic toxic materials comprising a member for a supercritical water process reaction apparatus, wherein said member comprises a Ni based alloy consisting of in weight basis:

Cr: more than 43% and 50% or less;

Mo: 0.1% to 2%;

Mg: 0.001% to 0.05%;

N: 0.001% to 0.04%;

Mn: 0.05% to 0.5%;

at least one of Fe: 0.05% to 1.0% and Si: 0.01% to 0.1%; and

a remainder as Ni and unavoidable impurities,

wherein a quantity of C amongst said unavoidable impurities is restricted to 0.05% or less, and the Ni based alloy consists essentially of a stabilized Ni-FCC matrix.

Here, the composition according to claim 2 is patentable over Yamanaka and Kritzer as described above. Therefore, a system comprising a composition of claim 2, that is, claim 28, should also be patentable.

CONCLUSION

It is respectfully submitted that each of the presently pending claims are in condition for allowance and notification to that effect is requested. Examiner is invited to contact the Applicants' representative at the below-listed telephone number if it is believed that the prosecution of this application may be assisted thereby.

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Respectfully submitted,

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Attachment: Declaration under 37 C.F.R. §1.132